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EVALUATING SCIENCE LEARNING ASSESSMENTS: ALIGNING 21ST-CENTURY SKILLS AND LOCAL WISDOM FOR FUTURE TEACHERS IN 5.0

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ABSTRACT

Recently, Indonesian higher education has redesigned curricula under the Merdeka Belajar-Kampus Merdeka (MBKM) policy to enhance student proficiency. This comprehensive framework covers learning outcomes, materials, processes, and assessment, with effective evaluation crucial for gauging learning outcomes and engaging students. This study explores the need for assessments based on local wisdom in science education to measure 21st-century skills for prospective teachers in Society 5.0. Using qualitative exploratory methods, the research involved interviews and document analysis with faculty from Universitas Islam Lamongan's Science Education Program. The findings reveal that while current assessments use diverse methods and address some 21st-century skills, they require better integration of local wisdom and consistent standards. Challenges include insufficient understanding of local wisdom integration, varied student competencies, and a lack of practical, context-driven strategies. The study recommends developing holistic assessments that incorporate local wisdom, practical experiences, and technology.

Keywords: science learning assessment; 21st-century skills; future teachers; local wisdom; era 5.0.

INTRODUCTION

In recent years, higher education institutions in Indonesia have been crafting curricula that provide students with numerous opportunities to master a wide range of knowledge. This curriculum is based on a policy by the Minister of Education and Culture, known as *Merdeka Belajar-Kampus Merdeka (MBKM)* (Kemendikbud, 2020a). Generally, the curriculum consists of four main elements: learning outcomes, study materials, the learning process to achieve these outcomes and assessment. In higher education, the learning program focuses on producing graduates with qualifications equivalent to those outlined in the Indonesian National Qualifications Framework. The Directorate General of Learning and Student Affairs has developed a concept for curriculum development that begins with defining graduate profiles, which are then translated into learning outcomes. Therefore, assessment plays a crucial role in identifying, collecting, and preparing data to evaluate the achievement of learning outcomes and curriculum goals. (Kemendikbud, 2020b).

Assessment plays a crucial role in measuring learning outcomes and sustaining students' engagement in the learning process. This approach is consistent with the National Higher Education Standards, prioritizing student-centered learning (SCL). SCL aims to

achieve learning outcomes by emphasizing the development of creativity, capacity, personality, and students' needs while fostering independence in seeking and acquiring knowledge (Kemendikbud, 2020b). By employing such learning strategies, students are expected to cultivate problem-solving and critical thinking skills, as well as proficiency in collaboration, creativity, communication, and literacy - all of which are indispensable skills for the 21st century (Hasibuan & Prastowo, 2019). The 21st century is widely regarded as the knowledge era, where the fulfillment of human needs is viewed through the lens of knowledge. However, 21st-century learning now demands not only the traditional 4Cs (collaboration, communication, creative thinking, and critical thinking) but also compassion and computation (6Cs) (Sari, Siregar, & Lubis, 2021). Prospective teachers, who will serve as facilitators, motivators, and inspirers, must possess the ability to equip students with 21st-century learning skills in preparation for the challenges of the 21st century. These skills enable teachers to instill systematic, logical, and critical thinking, thereby influencing the learning outcomes for students (Heny Sulistyaningrum, 2019). Several experts highlight the importance of mastering various 21st-century skills as a means to thrive in an era characterized by rapid and dynamic evolution (Septikasari & Frasandy, 2018).

To produce graduates with proficient 21st-century skills, higher education institutions must adapt to design relevant learning for the Society 5.0 era. Society 5.0, the super-smart society era introduced by the Japanese government in 2019 in response to the disruptive upheaval caused by the Industrial Revolution 4.0, raises concerns about the potential erosion of long-held human character values (Kemendikbud in (Arsanti, Zulaeha, Subiyantoro, & S, 2021)). Therefore, in science education, aligning scientific knowledge with the inculcation of scientific attitudes and local wisdom values is essential. Local excellence-based learning aims to create an environment and learning process that allows students to actively develop their skills, knowledge, and attitudes for national development. (Widyaningrum, 2018). When developing science education assessments, it is necessary to consider the sociocultural environment of the students, ultimately benefiting both the students and the broader community. (Suastra, 2010). Such an approach aligns with the current views in the 5.0 era, emphasizing that learning objectives should enhance not only knowledge but also understanding of human life itself.

Equipping prospective teachers with 21st-century learning skills is essential to enhance Indonesia's competitiveness on both national and global levels (Hendarman, 2019). As per the 2019 Global Competitiveness Index, Indonesia is ranked 50th out of 141 countries, trailing behind Malaysia (27th) and Thailand (40th) but surpassing Brunei Darussalam (46th), the Philippines (64th), and Vietnam (67th) (Schwab, 2019). These statistics underscore the pressing need to bolster students' 21st-century skills to drive positive advancements in the nation's development. Thus, a comprehensive analysis is warranted to develop innovative science education programs and assessments aimed at refining the critical thinking and learning capabilities of prospective teachers, thereby

elevating their competencies and global competitiveness.

The current research builds upon previous studies that have shown the effectiveness of using local wisdom-based e-instruments to enhance critical thinking skills. (Jarwo, Sumarno, & Siswanto, 2022). Another study found that junior high school students scored higher on 21st-century skills assessments when using these instruments compared to those who did not. (Dewanti & Santoso, 2020). These studies provide strong support for this research, as they both explore learning assessments for 21st-century skills and local wisdom. This research is unique in its comprehensive needs analysis for developing assessments for overall 21st-century skills, rather than solely focusing on critical thinking skills. Furthermore, while previous research focused on creating STEM-based learning assessments, this study examines the need for developing local wisdom-based assessments in the 5.0 era. Additionally, while previous research successfully measured 21st-century skills for basic and secondary education levels, implementing these assessments in higher education requires a needs analysis to guide the development of assessments aligned with different curriculum paradigms and graduate competency outcomes.

METHODS

This research constitutes an exploratory qualitative study that commences with the identification of issues and potentials, coupled with a comprehensive theoretical review of science education assessment, 21st-century learning skills measurement, the local wisdom content, and the requisites of the Society 5.0 era. Following this, data collection and qualitative analysis are carried out to yield a comprehensive understanding of the research subject. Data collection procedures commence with the preparation and validation of research instruments.

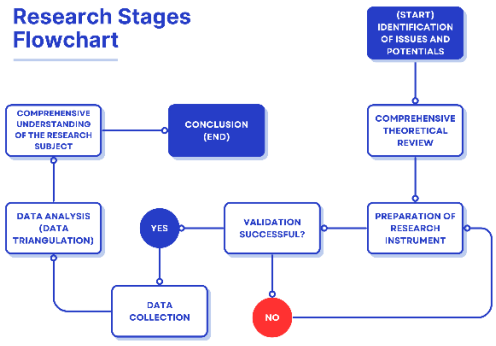

Figure 1. Research Stages Flowchart

Data were collected through semi-structured interviews and document studies (through analysis of semester lesson plans and assessment rubrics) involving selected informants through purposive sampling. In this instance, the informants consist of five lecturers from the Science Education Study Program at Universitas Islam Lamongan, who are facilitating science courses during the even semester of the 2023/2024 academic year. The science courses include topics such as biodiversity, household chemistry and additives, solutions, biotechnology, cell-level life, structure, function, and development of plants, natural resource and environmental conservation, electricity and magnetism, and ecology. It is expected that these informants will provide information related to the indicators of the research problem, encompassing the quality of science education assessments used to measure students' 21st-century skills, the attainment of students' 21st-century learning skills, the challenges encountered in the

implementation of science education assessments, the integration of local wisdom values in science education assessments in the era of 5.0, and the requisite innovations for the further development of science education assessments. The gathered data will subsequently be subjected to analysis using data triangulation techniques, ensuring an accurate and comprehensive representation of the phenomenon under study (Creswell & Poth, 2018)

RESULTS AND DISCUSSION

1. Description of Current Science Education Assessments

The assessment mechanisms for science courses in the Science Education Program Universitas Islam Lamongan for the even semester of the 2023/2024 academic year are functioning effectively. Most lecturers have embraced a comprehensive assessment approach that encompasses cognitive, attitude, and practical aspects through methods such as written exams, projects, individual assignments, group tasks, and assessments of student activity and attendance. This diverse approach enables the measurement of different types of student abilities and skills. The comprehensive approach to assessment in science education encompasses cognitive, attitudinal, and practical aspects, which align with the principles of authentic assessment. Authentic assessment emphasizes the evaluation of student's capacity to apply their knowledge in real-world scenarios, a concept supported by the diverse assessment methods utilized (Wiggins, 1990). Moreover, all courses taught by five lecturers incorporate various assessment types including written tests, projects, presentations, and portfolios. By implementing diverse assessment strategies, teachers can obtain a more comprehensive picture of students' abilities and development. Additionally, varied assessment strategies are effective in supporting learning as they provide more detailed feedback, helping students understand their strengths and weaknesses, and improving their performance in the future (Hattie & Yates, 2014).

Most lecturers utilize a percentage-based approach to process assessment results, with each assessment component assigned specific weightings (e.g., midterm exams 25%, final exams 25%, participation 15%, attendance 15%, and practical work 20%). Assigning specific percentages to different components of a student's grade, such as exams, assignments, and participation, helps to make the grading process more transparent and equitable. This approach facilitates a clearer understanding for both students and teachers regarding how each aspect of the coursework influences the overall grade, ensuring a more standardized and comprehensive assessment process (McMillan, 2011). Furthermore, most lecturers adhere to pre-designed assessment plans, conducting assessments throughout the course and at specific periods such as midterms or finals. The assessment results are systematically processed according to predetermined weightings. Employing a structured and systematic assessment process is vital for achieving learning objectives and ensuring the effectiveness of the educational process. In essence, a good

assessment directly supports and evaluates the achievement of the established learning objectives (Chappuis & Stiggins, 2017).

Despite the positive aspects of the assessment mechanism, several areas require attention for improvement. Firstly, only 1 out of 4 interviewed lecturers designed assessments with consideration for the course learning outcomes and established material coverage. This is concerning because alignment between the curriculum and assessment is essential for achieving the set learning objectives. This raises questions about whether the course learning outcomes have been fully measured. Only 2 out of 4 lecturers indicated that the course learning outcomes are "measured but not fully," citing reasons such as issues with student motivation, challenges in meeting course standards, difficulties in measuring achievement, incomplete achievements, and practical work not being fully completed. Studies have emphasized the importance of aligning assessments with learning outcomes to ensure comprehensive evaluation and effective learning (Biggs & Tang, 2011). Misalignment can result in students focusing on unassessed content, reducing the overall effectiveness of the educational process (Knight, Tait, & Yorke, 2006).

Secondly, some lecturers still set minimum grade standards (e.g., grade C), reflecting expectations for minimal competency achievements, which may not consider that each student has diverse skills and understanding, and learning should focus on the process. Research suggests that minimum grade standards can demotivate students and fail to capture the full spectrum of student abilities and learning progress (Brookhart, 2013). Moreover, a more formative approach to assessment, which focuses on continuous feedback rather than final grades, has been shown to enhance student learning and engagement (Black & William, 2009)

Lastly, only 1 out of 5 lecturers can demonstrate objective assessment standards to ensure fair and accurate results through assessment rubrics or criteria. Rubrics and criteria play a central role in ensuring consistency and providing constructive feedback, driving continuous improvement. Rubrics can clarify expectations, provide detailed feedback, and help students self-assess and reflect on their learning (Andrade, 2005). Furthermore, one of the research supports the use of rubrics for improving student performance and learning outcomes by providing clear and objective standards (Panadero & Jonsson, 2013).

2. Assessment of 21st-Century Skills in Students

The majority of lecturers have been making efforts to assess 21st-century skills such as creativity, collaboration, digital competence, and communication. However, the results have not been optimal. A review of course syllabi and assessment designs revealed that:

a. All courses taught by 5 lecturers incorporate learning strategies designed to nurture 21st-century skills.
b. 5 out of 9 course syllabi include learning materials relevant to 21st-century skills.
c. 6 out of 9 courses have assessment criteria covering aspects of 21st-century skills such as collaboration, creativity, critical thinking, and communication.

Assessments usually involve presentations, reports, projects, and simple experiments, aiming to integrate real-world practices to foster current-era skills. While these techniques support collaboration and creativity, they have not yet achieved the expected level of effectiveness. Students prefer these techniques as they provide opportunities for broader expression and skill development. One lecturer reported an 80% improvement in students' 21st-century skills after implementing these techniques.

However, some lecturers still struggle to create assessments that effectively meet 21st-century learning criteria. The documentation study discovered that:

a. No course and sub-course learning outcomes integrate 21st-century skills in the course syllabi. Typically, only one of these skills is present, not their overall integration.
b. No clear methods for evaluating the achievement of 21st-century skills are found in the course syllabi.
c. Only 4 out of 9 courses use assessment types suitable for measuring 21st-century skills.
d. Only 2 out of 9 courses provide opportunities for reflection and feedback that support the development of 21st-century skills.
e. No course assessments show clear and consistent standards for evaluating 21st-century skills.

Recent research emphasizes the importance of effectively assessing 21st-century skills. Integrating these skills into education requires new teaching methods and innovative assessment strategies that accurately capture complex skill sets. Professional development programs are necessary to equip educators with the tools and knowledge to design and implement effective assessments (Voogt, Erstad, Dede, & Mishra, 2019).

Traditional assessment methods are often inadequate for measuring 21st-century skills, suggesting a need for more dynamic and formative assessment practices. Advocates propose using digital tools and performance-based assessments to provide more comprehensive evaluations of student abilities (Redecker & Johannessen, 2013).

The Technological Pedagogical Content Knowledge (TPACK) framework highlights the need for educators to blend content knowledge with pedagogical and technological understanding to create effective learning environments. This framework is particularly relevant for assessing 21st-century skills as it encourages the integration of technology in both teaching and assessment (Mishra & Koehler, 2006).

Recent studies also underscore the importance of reflection and feedback in developing 21st-century skills. Formative feedback is crucial for student learning and development, providing opportunities for students to reflect on their performance and make improvements (Nicol & Macfarlane-Dick, 2006).

In conclusion, while efforts have been made to assess 21st-century skills, there is a clear need for enhanced training and professional development for lecturers. By adopting innovative assessment strategies and providing opportunities for reflection and feedback, educators can more effectively measure and support the development of these crucial skills.

3. Problems and Challenges in Implementing Science Education Assessments

Key challenges in assessments often stem from low student interest in learning, which directly impacts assessment results. A lack of motivation can significantly affect the quality of work and outcomes. Motivation plays a crucial role in influencing students' engagement, persistence, and performance in educational tasks. Without adequate motivation, students are less likely to exert the necessary effort to achieve high-quality work and outcomes (Schunk & DiBenedetto, 2020).

Designing and implementing assessments to ensure fair opportunities for achieving learning goals can be challenging due to limited time and varying levels of student competency. Educators need to adopt flexible and differentiated assessment strategies that cater to individual learning needs, considering time constraints and diverse student abilities. Formative assessments and personalized feedback are essential in supporting all students to meet their learning objectives (Darling-Hammond, Flook, Cook-Harvey, Barron, & Osher, 2019).

To ensure students reach the required competency levels for specific academic goals, there is a need to align student grades with certain minimum standards (e.g., grade C). However, this approach may overlook the diverse skills and understanding of each student. It would be more beneficial for grading practices to prioritize individual progress and mastery of content, rather than solely focusing on meeting arbitrary standards. Standards-based grading systems offer a more accurate reflection of students' learning and competencies (Guskey & Brookhart, 2019).

Fourth, students may encounter financial constraints and have limited access to required learning resources that necessitate specific tools and equipment. Financial barriers can impede students' full participation in learning activities and assessments. The OECD recommends augmenting funding and resource allocation to guarantee equitable access to quality education for all students ((OECD), 2018).

Finally, there is a discrepancy between the student's abilities and the extensive breadth of material that must be mastered. One of the main challenges is the large number of topics covered in some courses, which makes it difficult for students to thoroughly grasp everything. Instructors should take into consideration this gap when selecting appropriate assessment methods to accurately evaluate students' understanding and abilities. A well-designed curriculum should find a balance between the depth and breadth of content to ensure that students can achieve a comprehensive understanding without feeling overwhelmed. It is recommended to utilize integrated assessments that allow students to demonstrate their knowledge and skills across multiple topics in a cohesive manner (Fink, 2019).

4. Internalization of Local Wisdom Values in Science Education Assessments in the 5.0 Era

Many lecturers struggle with integrating local wisdom and 21st-century skills into their teaching and assessments. This struggle primarily stems from a lack of understanding of how to effectively

incorporate these elements. The findings from a documentation study (checklist analysis) of course syllabi and assessment designs for 9 observed courses reveal the following:

a. Only 2 out of 9 courses apply learning strategies that consider integrating local wisdom values in the context of science education.
b. Only 3 out of 9 courses include learning materials related to current issues and local contexts.
c. None of the courses have assessments that contribute to measuring students' ability to apply and internalize local wisdom values.
d. Only 1 out of 9-course assessments integrates local wisdom values into the assessment criteria.
e. Only 2 out of 9 assessments encourage active student involvement and collaboration with local stakeholders or communities.

The obstacles encountered by educators in integrating these components are evident in current literature. For instance, a previous study emphasized that integrating local wisdom into educational curricula necessitates a nuanced grasp of cultural contexts and effective pedagogical strategies. The study stresses the importance of professional development and training for educators to address this knowledge gap (Arifin, Susilo, & Rohman, 2020).

Certain lecturers have made deliberate efforts to integrate local wisdom values and 21st-century skills into their teaching and assessments, particularly in specific contexts such as integrating science concepts into everyday life, undertaking concrete projects related to environmental issues, and involving students in identifying local flora and fauna and creating outputs like books. This has been confirmed through an examination of course syllabi and assessment designs, revealing that 6 out of 9 course syllabi are adaptable to students' needs and changes in social and technological contexts. This demonstrates an intention to bridge academic concepts with practical everyday applications, providing more direct relevance for students. However, this approach is not consistently or comprehensively applied across all course topics. Research conducted by (Rahman, Ahmad, & Saleh, 2021) supports these findings, indicating that effective integration of local wisdom into the curriculum enhances students' engagement and understanding of scientific concepts through real-world applications. Similarly, studies by (Trilling & Fadel, 2009) emphasize that 21st-century skills, such as critical thinking and collaboration, are best developed through hands-on, project-based learning experiences that connect with students' cultural backgrounds and community contexts.

5. Innovations Needed in Developing Science Education Assessments

Overall, the needed innovations are more towards implementing holistic, integrated approaches with local values and focusing on relevant and practical experiences for students in the current digital and global era. Details are as follows:

a. Incorporating students' ideas and products that showcase local wisdom and cultural preservation into digital platforms is essential. This approach demonstrates an understanding of the importance of upholding cultural values

in the digital age. Recent studies underscore the vital role of digital platforms in promoting cultural heritage and educational engagement. By utilizing digital storytelling platforms, students can deepen their comprehension and appreciation of local wisdom through the creation and sharing of culturally relevant content (Siagian, Hasibuan, & Nugroho, 2021).

b. Project-based assessments underscore the significance of real-world experiences in learning, offering students a deeper understanding and practical skills. This approach fosters critical thinking and problem-solving skills by involving students in meaningful projects that connect classroom learning with real-world applications (Tanujaya, Mumu, & Margono, 2017).
c. It is essential to incorporate students' community activities into assessments, as this fosters the integration of learning into real-world contexts, thus enhancing its relevance and positive impact. By including community-based projects in assessments, not only do we improve students' academic performance, but we also promote their sense of social responsibility and community engagement (Dewi, Kusumawati, & Artini, 2019).
d. The focus is on utilizing assessments that openly measure course outcomes, promote collaboration between students and stakeholders/communities, and leverage technology and artificial intelligence (AI). The aim is to use technology as a tool to improve the efficiency and objectivity of assessments, while still prioritizing the process and active student participation. Recent advancements in AI and educational technology offer new possibilities for developing more effective and inclusive assessment methods. AI-driven assessments can provide personalized feedback and adaptive learning paths, thereby enhancing the overall learning experience (Cheng & Lai, 2019).

CONCLUSION

The study indicates that although the current assessment methods for the Science Education Study Program at Universitas Islam Lamongan are generally effective and diverse, areas require improvement. The use of various assessment methods adheres to authentic assessment principles and provides a comprehensive understanding of students' abilities. However, challenges such as misalignment between course outcomes and assessments, reliance on minimal grade standards, and lack of clear criteria need to be addressed. Enhancements can be achieved through better alignment with learning outcomes, incorporation of formative assessments, and utilization of explicit rubrics. Furthermore, the evaluation of 21st-century skills and integration of local wisdom necessitates further development through innovative methods like digital platforms and project-based assessments.

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REFERENCES

(OECD), O. f.-o. (2018). *Equity in education: Breaking down barriers to social mobility*. OECD Publishing.

Andrade, L. H. (2005). Teaching with rubrics: The good, the bad, and the ugly. *College Teaching*, 27-31.

Arifin, M., Susilo, H., & Rohman, F. (2020). The integration of local wisdom into the science curriculum: A case study in Indonesia. *Journal of Science Education and Technology*, 527-537.

Arsanti, M., Zulaeha, I., Subiyantoro, S., & S, N. H. (2021). Tuntutan Kompetensi 4C Abad 21 dalam Pendidikan di Peguruan Tinggi untuk Menghadapi Era Society 5.0. *Prosiding Seminar Nasional Pascasarjana Universitas Negeri Semarang* (pp. 319-324). Semarang: PPS UNNES.

Biggs, J., & Tang, C. (2011). *Teaching for quality learning at university (4th ed.)*. UK: Open University Press.

Black, P., & William, D. (2009). Developing the theory of formative assessment. *Educational Assessment, Evaluation, and Accountability*, 5-31.

Brookhart, S. M. (2013). *How to create and use rubrics for formative assessment and grading.* Virginia USA: ASCD.

Chappuis, J., & Stiggins, R. J. (2017). *An Introduction to Student Involved Assessment FOR Learning Seventh Edition.* Pearson.

Cheng, G., & Lai, C. (2019). Facilitating learning from feedback with technology. *Educational Technology Research and Development*, 341-354.

Creswell, J. W., & Poth, C. N. (2018). *Qualitative Inquiry and Research Design: Choosing Among Five Approaches (4th ed.).* California: Sage Publications.

Darling-Hammond, L., Flook, L., Cook-Harvey, C., Barron, B., & Osher, D. (2019). Implications for educational practice of the science of learning and development. *Applied Developmental Science*, 97-140.

Dewanti, B. A., & Santoso, A. (2020). Development of 21st Century Learning Skills Assessment Instruments in STEM-Based Science Learning (Science, Technology, Engineering, and Mathematics). *Prisma Sains: Jurnal Pengkajian Ilmu dan Pembelajaran Matematika dan IPA IKIP Mataram*, 99-111.

Dewi, N. E., Kusumawati, M., & Artini, L. P. (2019). Community-based projects as a tool to develop students' social responsibility. *International Journal of Innovation, Creativity and Change*, 40-55.

Fink, L. D. (2019). *Creating significant learning experiences: An integrated approach to designing college courses.* Josey-Bass.

Guskey, T. R., & Brookhart, S. M. (2019). *What we know about grading: What works, what doesn't, and what's next.* UK: ASCD.

Hasibuan, A. T., & Prastowo, A. (2019). Konsep Pendidikan Abad 21: Kepemimpinan dan Pengembangan Sumber Daya Manusia SD/MI. *Magistra*, 25-50.

Hattie, J., & Yates, G. C. (2014). *Visible Learning and the Science of How We Learn.* London: Routledge.

Hendarman. (2019). CHALLENGES FOR 21st CENTURY LEARNING IN INDONESIA. *The Fourth*

International Conference on Education and Language (4th ICEL) 2016 (pp. 19-25). Bandar Lampung, Lampung, Indonesia: Universitas Bandar Lampung (UBL).

Heny Sulistyaningrum, A. W. (2019). ANALISIS KEMAMPUAN AWAL 21stCENTURY SKILLSMAHASISWA CALON GURU SD. *JPDN*, 142-158.

Jarwo, Sumarno, & Siswanto, J. (2022). Pengembangan E-Instrumen Keterampilan Berpikir Kritis Berbasis Kearifan Lokal untuk Siswa Kelas VI SD. *Jurnal Kualita Pendidikan*, 67-71.

Kemendikbud. (2020a). *Buku Saku Panduan Merdeka Belajar Kampus Merdeka.* Direktorat Jenderal Pendidikan Tinggi.

Kemendikbud. (2020b). *Panduan Penyusunan Kurikulum Pendidikan Tinggi di Era Industri 4.0 untuk Mendukung Merdeka Belajar Kampus Merdeka.* Direktorat Jenderal Pendidikan Tinggi.

Knight, P. T., Tait, J., & Yorke, M. (2006). The professional learning of teachers in higher education. *Studies in Higher Education*, 319-339.

McMillan, J. H. (2011). *Classroom Assessment: Principles and Practice for Effective Standards-Based Instruction.* Boston: Pearson.

Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A framework for integrating technology in teachers' knowledge. *Teachers College Record*, 1017-1054.

Nicol, D. J., & Macfarlane-Dick, D. (2006). Formative assessment and self-regulated learning: A model and seven principles of good feedback practice. *Studies in Higher Education*, 199-218.

Panadero, E., & Jonsson, A. (2013). The use of scoring rubrics for formative assessment purposes revisited: A review. *Educational Research Review*, 129-144.

Rahman, F., Ahmad, M., & Saleh, A. (2021). Integrating local wisdom in science education: Challenges and strategies. *International Journal of Science and Mathematics Education*, 1225-1240.

Redecker, C., & Johannessen, O. (2013). Changing assessment—Towards a new assessment paradigm using ICT. *European Journal of Education*, 79-96.

Sari, S. P., Siregar, E. F., & Lubis, B. S. (2021). Pengembangan Pembelajaran Blended Learning Berbasis Model Flipped Learning untuk Meningkatkan 6C For HOTS Mahasiswa PGSD UMSU. *Jurnal BASICEDU*, 3460-3471.

Schunk, D. H., & DiBenedetto, M. K. (2020). Motivation and social cognitive theory. *Contemporary Educational Psychology*, 60.

Schwab, K. (2019). *The Global Competitiveness Report 2019.* Geneva Switzerland: World Economic Forum.

Septikasari, R., & Frasandy, R. N. (2018). KETERAMPILAN 4C ABAD 21 DALAM PEMBELAJARAN PENDIDIKAN DASAR. *Tarbiyah Al-Awlad : Jurnal Kependidikan Islam Tingkat Dasar*, 107-117.

Siagian, P., Hasibuan, Z., & Nugroho, L. E. (2021). Digital storytelling in education: Enhancing students' understanding of local wisdom. *Journal of Educational Technology Development and Exchange*, 115-134.

Suastra, I. W. (2010). Model Pembelajaran Sains Berbasis Budaya Lokal untuk Mengembangkan Kompetensi Dasar Sains dan Nilai Kearifan Lokal di SMP. *Jurnal Pendidikan dan Pengajaran*, 8-16.

Sugiyono. (2014). *Metode Penelitian Kuantitatif, Kualitatif, dan R & D.* Bandung: CV Alfabeta.

Tanujaya, B., Mumu, J., & Margono, G. (2017). Project-based learning fosters critical thinking and problem-solving skills by engaging students in meaningful projects that connect classroom learning with real-world applications. *International Education Studies*, 78-85.

Trilling, B., & Fadel, C. (2009). *21st Century Skills: Learning for Life in Our Times.* Josey-Bass.

Voogt, J., Erstad, O., Dede, C., & Mishra, P. (2019). Challenges to learning and schooling in the digital networked world of the 21st century. *Journal of Computer Assisted Learning*, 634-647.

Widyaningrum, R. (2018). Analisis Kebutuhan Pengembangan Model Pembelajaran Berbasis Etnosains untuk Meningkatkan Kualitas Pembelajaran IPA dan Menanamkan Nilai Kearifan Lokal di Sekolah Dasar. *Widya Wacana*, 26-32.

Wiggins, G. (1990, Dec). *The Case for Authentic Assessment. ERIC Digest.* Retrieved from https://eric.ed.gov/?id=ED328611